

**IV. AMENDMENTS TO THE CLAIMS**

1. - 28. (Canceled)

29. (Currently Amended) A quartz glass crucible for pulling up a silicon single crystal, said quartz glass crucible having an opaque outer layer formed by melting natural silica powder and a transparent layer structure formed on the inside thereof, characterized in that the transparent layer structure includes a transparent layer made of natural quartz glass with a thickness of 0.4 to 5.0 mm covering the entirety of the inside of the crucible, and a transparent layer made of a synthetic quartz glass having a lower transparent layer portion with a thickness in the range of 0.2 to 1.5 mm and formed on and covering a lower portion of the transparent layer made of the natural quartz glass of the inside of the crucible in a range from at least 0.15 to 0.55 L, and an upper transparent layer portion with a thickness of 0.2 mm or less and formed on and covering an upper portion of the transparent layer made of the natural quartz glass of the inside of the crucible in a range from 0.6 to 1.0 L in terms of distance L from the a center of a bottom of an inner surface of the quartz glass crucible to an upper end face along the inner surface of the crucible;

~~wherein the transparent layer made of the synthetic quartz glass has a thickness in a range of 0.2 to 1.5 mm inclusively and~~

~~wherein the transparent layer made of a synthetic quartz glass with a thickness of 0.2 mm or less is formed on the inner surface of the crucible in the range from 0.6 to 1.0 L in terms of a distance L from the center of the bottom of the inner surface of the quartz glass crucible to the upper end face along the inner surface thereof.~~

30. (Canceled)

31. (Canceled)

32. (Canceled)

33. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 29, characterized in that an average OH group concentration  $C_A$  in the transparent layer made of a synthetic quartz glass is from 100 to 300 ppm, an average OH group concentration  $C_B$  in the transparent layer made of natural quartz glass is from 60 to 150 ppm, an average OH group concentration  $C_C$  in the opaque outer layer made of natural quartz glass is from 20 to 60 ppm, and they satisfy the relation:  $C_A > C_B > C_C$ .

34. (Previously Presented) A method for producing a quartz glass crucible for pulling up a silicon single crystal according to Claim 29, characterized by making an inner cavity of a quartz glass crucible base body mounted on a rotatable mold a high temperature atmosphere, feeding natural silica powder to the high temperature atmosphere in the inside of an opaque outer layer after or during the formation of the opaque outer layer by partially melting the inner cavity to form the transparent layer made of natural quartz glass on the entire inner surface of the opaque outer layer by melting and vitrifying the natural silica powder, and then feeding a synthetic silica powder and melting and vitrifying the synthetic silica powder to form the transparent layer made of a synthetic quartz glass on the inside of the crucible in the range from at least 0.15 to 0.55 L in terms of a distance L from the center of the bottom of the inner surface of the quartz glass crucible having the transparent layer made of natural quartz glass to the upper end face along the inner surface of the crucible.

35. (Previously Presented) A quartz glass crucible for pulling up a silicon single crystal, said quartz glass crucible having an opaque outer layer made of natural quartz glass and a transparent layer formed on the inside thereof, characterized in that the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of a silicon melt to 0.3 M in terms of a length M from the initial surface level of the silicon melt to the surface level of the remaining melt after pulling up a single crystal measured along the inner surface of the quartz glass crucible is 1.8-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt.

36. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 35, characterized in that the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of a melt to 0.3 M is 2.5-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt.

37. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 35, said quartz glass crucible having an opaque outer layer made of natural quartz glass and a transparent layer formed on the inside thereof, characterized in that a transparent layer made of natural quartz glass or a mixture of natural and synthetic quartz glasses is formed on the inner surface of the crucible in the range from the initial surface level of a silicon melt to 0.3 M in terms of a length M from the initial surface level of the silicon melt to the surface level of the remaining melt after pulling up a single crystal measured along the inner surface of the quartz glass crucible, a transparent layer made of a synthetic quartz glass is formed on the inner surface of the crucible in the range up to 0.3 M above the surface level of the remaining melt, and the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of the melt to 0.3 M is 1.8-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt.

38. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 37, characterized in that the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of a melt to 0.3 M is 2.5-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt.

39. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 35, said quartz glass crucible having an opaque outer layer made of natural quartz glass and a transparent layer formed on the inside thereof, characterized in that the inner surface of the crucible in the range from the initial surface level of a melt to 0.3 M is subjected to an etching treatment

or a sandblast process, and the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range after it is used for pulling up a silicon single crystal is 1.8-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt which is not subjected to the etching treatment or the sandblast process.

40. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claim 39, characterized in that the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of a melt to 0.3 M is 2.5-fold or more greater than the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt.

41. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claims 35, characterized in that the number of brown rings observed in the range up to 0.3 M above the surface level of the remaining melt is 0.02 to  $0.9/\text{cm}^2$ .

42. (Previously Presented) The quartz glass crucible for pulling up a silicon single crystal according to Claims 35, characterized in that the number of brown rings per unit area ( $\text{cm}^2$ ) observed in the range from the initial surface level of a melt to 0.3 M is 2.0 to  $5.0/\text{cm}^2$ .

43. (Previously Presented) A method for producing a quartz glass crucible for pulling up a silicon single crystal according to Claim 35, characterized by making an inner cavity of a quartz glass crucible base body mounted on a rotatable mold a high temperature atmosphere, feeding natural silica powder or a powder mixture of natural and synthetic silicas to the high temperature atmosphere in the inside of an opaque outer layer after or during the formation of the opaque outer layer by partially melting the inner cavity to form a transparent layer made of natural quartz glass or a mixture of natural and synthetic quartz glasses in the range from the initial surface level of a melt to 0.3 M by melting and vitrifying the natural silica powder or the powder mixture of natural and synthetic silicas, and then feeding a synthetic silica powder and melting and vitrifying the synthetic silica powder to

form a transparent layer made of a synthetic quartz glass on the inner surface of the crucible in the range up to 0.3 M above the surface level of the remaining melt.